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EDITORIAL

The art of synoptic tables

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Abstract

This editorial of Vegetation Classification and Survey (VCS) focusses on how to prepare good synoptic tables. While synoptic tables are a core element for the standardised documentation of classification schemes, we regularly find that authors are challenged with preparing them in a concise and informative manner. Thus, we explain the key aspects of synoptic tables and how we handle them in VCS. The central information should always be the percentage constancy, not a constancy class (loss of information) nor the phi-value or any other measure of fidelity (because these depend on which other columns are included in the table). While in the main text there is usually only space for a shortened synoptic table (which should include the most frequent companion species), it is crucial that a full version is provided in the supplementary material, and the criteria for shortening and sorting should be documented transparently. On a more general note, VCS is generally doing well with a first Journal Impact Factor of 3.0 being published and the CiteScore constantly increasing. Finally, we present the four Editors' Choice articles of the year, among which Joelson et al. (2025; Vegetation Classification and Survey 6: 37–56) won the Editors' Award 2025.

Abbreviations: VCS = Vegetation Classification and Survey.

Keywords

companion species, constancy table, EcoVeg approach, Editors' Award, diagnostic species, hierarchy, percentage constancy, phi value, phytosociology, relevé, synoptic table, vegetation classification

Introduction

Vegetation classification is a powerful tool to describe the diversity of plant species assemblages on our planet. It provides a multi-purpose typology that is useful for nature conservation, habitat mapping as well as ecological and biogeographical research (Dengler et al. 2008; De Cáceres et al. 2015; Faber-Langendoen et al. 2025). From a methodological point of view, this classification of vegetation means reducing the complexity of the underlying data (usually plot records with species lists and cover estimates) by aggregating them into abstract units.

There are various ways to present the results of a classification exercise: dendrograms, ordination diagrams (partitioned into subareas corresponding to vegetation units), distribution maps and lists of the diagnostic, constant and dominant species of each unit (De Cáceres et al. 2015). For floristic classification, the diagnostic species are of particular importance because they define the vegetation units and enable the assignment of new plots to these units. Moreover, species lists contain a lot of ecological and biogeographical information that can be used to formulate hypotheses about the factors responsible for the observed vegetation patterns.

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In VCS, we expect authors of plot-based classification studies to present their results in synoptic tables, i.e. tables that contain several vegetation units and thus allow their direct comparison. Synoptic tables come in two forms that also can be combined. The first kind, tables with individual relevés, is usually too space-consuming for the main text, but we strongly recommend this for supplementary materials. The second kind, tables where columns represent vegetation units and rows species with values indicating percentage constancies (frequencies), is a more concise yet informative way to present the data and recommended for the main body of the paper. Constancy tables have been used in phytosociology at least since the early 1950s (Tüxen 1951, 1952). They combine the ideas of ordered relevé tables (Braun-Blanquet 1921) and species lists with constancy values (Braun-Blanquet 1933) to represent derived classification schemes in a condensed manner. In comparison to lists of diagnostic and constant species given in the text, a synoptic table contains much more information and – if well prepared – enables a fast review of the floristic patterns in the presented vegetation types. At the same time a good synoptic table demonstrates whether a classification is sound or not.

Therefore, synoptic tables have become standard in phytosociology (Braun-Blanquet school). Other schools of vegetation classification, such as the EcoVeg approach (Faber-Langendoen et al. 2014, 2025), have also started to use synoptic tables in some of their recent publications (e.g. Liu et al. 2022; Goodson et al. 2025). As Chief Editors of VCS we are convinced that, irrespective of the approach adopted for vegetation classification, synoptic tables are the cornerstone of presenting its results, and consider them obligatory in studies that present classification systems. However, compared to the pre-computer and pre-statistics era of J. Braun-Blanquet and R. Tüxen, our needs for synoptic tables have considerably changed, meaning that not everything that was an accepted standard in the past still can be considered as such. VCS considers itself as the globally leading journal in the field of vegetation classification. Thus, it is our role and responsibility to regularly question standards and to develop them further to match the present-day needs of the research area.

In the following, we discuss the main points that should be taken into account when compiling a synoptic table. They are obligatory for publications in VCS but also recommended for publications elsewhere. Subsequently, we give a brief overview of main aspects of journal development in the year 2025, present the four Editors' Choice articles of that year and inform about changes in the editorial team becoming effective in 2026.

How to prepare a good synoptic table

Headers

Synoptic tables must include at least two header rows: one with the numbers/codes of the vegetation units (this row must always be on the top), and one with the number of plots in each column. Numbers or codes of the vegetation units should be explained in the table caption unless they are given in a separate table or are identical with the subheadings in the description of the units. If the units are arranged in different hierarchical levels (e.g., alliances, orders, classes), these levels can be indicated either as separate rows or by using hierarchical codes (e.g., 1.1, 1.2, 2.1 etc.). The sequence of vegetation units should follow the sequence of their description in the text. Additional header rows may be included for important environmental variables or diversity metrics (e.g., mean species richness).

Constancy, fidelity and average cover

Percentage constancy (also known as percentage frequency), i.e., the percentage of plots of each unit in which the species is present, must be given as the main information in synoptic tables. Zero values should be given as dots (not as zeros, dashes or blanks) to increase readability. Constancy classes (I, II, III, IV, V) as they were introduced by Braun-Blanquet (1921) and widely used in classical phytosociological works (e.g. Braun-Blanquet 1933; Bolòs and Bolòs 1950; Tüxen 1952; Dierschke 1997) are not accepted in VCS. In fact, we consider constancy classes generally not acceptable in the 21st century because of (a) the severe loss of information and (b) the fact that numerical fidelity measures are not applicable to constancy classes.

While some authors tend to give a measure of fidelity (e.g. phi-value, Chytrý et al. 2002, or IndVal, Dufrêne and Legendre 1997) as the main or even the sole information in their synoptic tables, we do not allow this option in VCS for a simple reason: Fidelity measures are context-dependent, i.e., they change depending on how many and which other columns are included in a table, while constancy is an absolute and permanent description of the data included in a column. However, we recommend to present fidelity as a subordinate information to each column as it measures how strictly a species is bound to a vegetation type (and *vice versa*) and thus is a measure of the distinctness of the presented units. Fidelity could essentially be presented in five different ways:

- No differentiation between different levels of fidelity, i.e. all species above a certain threshold of fidelity are equally highlighted (e.g. Vassilev et al. 2024; Vynokurov et al. 2024)
- Precise fidelity value in a separate column to the right of the constancy column (e.g. Liu et al. 2022; Goodson et al. 2025). Generally, this approach is less recommendable as it makes tables more space-consuming and difficult to read.
- Precise fidelity value as a superscript to the constancy value (e.g. Świerkosz et al. 2018; Świerszcz et al. 2023).

- Categorical fidelity value as a superscript to the constancy value. Michl et al. (2010) and Luther-Mosebach et al. (2012), for example, use three categories: ** = highly diagnostic, * = diagnostic, ° = more frequent than average.
- Categorical fidelity value translated into different shadings of the cell (e.g. Chytrý 2007; García-Mijangos et al. 2021; Joelson et al. 2025).

When working with numerical measures of fidelity, such as phi-values, it is important to keep the following points in mind: (1) Higher precision is not better, meaning that using just two or three categories is typically more informative to readers than precise values, which just overload the table with irrelevant details. It is not admissible to present phi-values multiplied by 100 with one decimal place. Unfortunately, this is the default output of the JUICE program, but to allow the calculation of phi values with such a precision, one would need to have thousands of plots per column. (2) The classical phi value (Chytrý et al. 2002) is usually not a good choice unless the number of plots per column is equal or very similar. To avoid counter-intuitive "results" where a species is labelled as diagnostic in a unit where it is less frequent than in a unit where it is not considered diagnostic, one should use the standardised phi-values by Tichý and Chytrý (2006). (3) Proper thresholds of fidelity measures are highly context-dependent: the narrower the scope in geographical and ecological terms, the higher one should set the threshold. This means that in a local study of one habitat type, one might only consider species with phi-values above 0.3 as diagnostic (Dengler et al. 2019), while in a continental study of all vegetation types 0.15 might be a reasonable threshold (Chytrý et al. 2020).

Instead of, or in addition to, a fidelity measure one could additionally integrate cover/dominance – keeping in mind that constancy is obligatory. To indicate dominant species, the constancy values of species exceeding a certain average cover can be given in bold (e.g. Willner 2024). Average cover can also be reported as superscript (e.g. Zeballos et al. 2023) and should always be calculated including zero values (i.e., including the plots where the species is absent). Alternatively, the median cover value may be given.

Selecting, sorting and highlighting of species

In the main text of classification papers, there is typically only space for an abbreviated version of a synoptic table - unless describing species-poor vegetation based on rather few vegetation plots. This fact has two implications: (1) The full, non-abbreviated table needs to be presented in the supplementary material, optimally combined with the individual relevés underlying the synoptic table. (2) The selection of species shown in the abbreviated version must be well considered. Some authors tend to present only the diagnostic species of the vegetation units and none of the companion species. We do not consider this approach admissible in VCS as (a) the companion species in a table are often the most frequent and dominant ones and thus particularly important to give a realistic description of the communities and (b) many of those species that are not diagnostic within a specific table would become diagnostic as soon as columns of other vegetation types are added. Therefore, an abbreviated table should include, on the one hand, the highly diagnostic species of the individual vegetation units and, on the other hand, the most common companion species, at least all those with an overall constancy of 20% and more. The thresholds used for inclusion/exclusion of a species in the abbreviated table should be clearly stated in the caption.

To make a synoptic table an informative tool of community description, a meaningful sorting and the highlighting of species (rows) is essential. The species should be sorted and grouped to indicate the floristic differentiation of vegetation units. The best way to achieve this is shading of diagnostic species blocks and group headings in the species column. Framing might be used, too, but only in addition to (not instead of) shading. For instance, the combination of shading and framing can be useful to distinguish diagnostic species of different hierarchical levels (e.g. Willner et al. 2024). Criteria and thresholds used for defining diagnostic species should be clearly described in the Methods (and briefly in the table caption) and strictly followed. Diagnostic species should be sorted by decreasing fidelity or decreasing constancy, depending on the authors' preferences, while the companion species at the bottom of the table should be sorted by decreasing overall constancy (i.e. in the entire table).

Hierarchical classification

It is widely accepted in vegetation classification that a hierarchical approach is meaningful and informative as it reflects the different degrees of floristic and ecological similarity and thus enables to "zoom in" and "zoom out" within one classification system as needed. Essentially, all widely used classification approaches that are applied globally have an inherent hierarchy, like the Braun-Blanquet approach (Braun-Blanquet 1921, 1964; Dengler et al. 2008) and the EcoVeg approach (Faber-Langendoen et al. 2014, 2025) as well as the widely used European habitat typology EUNIS (Chytrý et al. 2020). It is thus surprising that many modern studies in vegetation classification essentially classify only at the lower-most level with numerical approaches to then combine the derived units into superior units *post hoc* by "expert knowledge". One reason for the widespread neglect of hierarchy as the essence of a good classification might lie in the fact that in the widely used computer program JUICE (Tichý 2002) the hierarchical application of phi-values is not straightforward. Thus, researchers are forced to find workarounds involving manual tabular work (e.g. Kącki et al. 2020; García-Mijangos et al. 2021; Vassilev et al. 2024; Vynokurov et al. 2024).

The presentation of a hierarchical classification system in synoptic tables can be separate for hierarchical levels (e.g. García-Mijangos et al. 2021; Liu et al. 2022). If space allows, several hierarchical levels may be combined in one synoptic table (e.g. Vassilev et al. 2024; Vynokurov et al. 2024). In any case, the diagnostic species of the higher levels should be grouped and highlighted as well. This may require calculating the fidelity separately for the different hierarchical levels (e.g., associations and alliances). While coming with some additional challenges, this is still a more informative approach than presenting the diagnostic species of higher ranks as part of a heterogeneous group of "species diagnostic for more than one unit". The diagnostic species of different hierarchies can be given either in descending (higher level first) or ascending (lower level first) order but always retaining the nested structure. Moreover, presenting a hierarchical synoptic table typically also involves additional labelling of so-called transgressive diagnostic species, i.e. those that are diagnostic at more than one level (e.g. Vynokurov et al. 2024).

Layers

In tables of multi-layered vegetation types, such as forests, it might be desirable to show species constancy separately for the different layers. This can be done in different ways: First, the tree, shrub, herb and cryptogam layers can be given separately (in this order); second, the occurrences of the same species in different layers can be kept together (with the highest layer given first, followed by the lower ones). Both alternatives are acceptable, while the third possibility, to treat species occurrences in different layers just as if they were independent taxa, is strongly discouraged. This is particularly problematic if occurrences of a species in different layers are given different diagnostic values, as these differences are usually artifacts of inconsistent sampling strategies (e.g., regarding the definition of layers) or due to varying forest management.

Different taxonomic levels

Formally, like occurrences in different layers, a taxon might appear at different taxonomic levels in a table (e.g., subspecies, species, section/aggregate). In such cases, the lower taxonomic ranks must be given directly below the higher one they belong to, and this hierarchical relationship must be clearly indicated in the species column (e.g., by using different font sizes and/or indents). Moreover, information should be provided whether the lower taxonomic ranks were recorded in all plots or just in a portion of them. Alternatively, the different taxonomic resolutions can be merged at the highest level in such cases. Importantly, the diagnostic value can only be calculated in a meaningful manner for the merged row.

Additional species data

In some cases, it might be desirable to report additional species information, such as taxonomic group, life form, geographical distribution or diagnostic value in the literature. These data can be given in separate columns directly after (or before) the species names. As space is limited, these data will usually be abbreviated or coded. Abbreviations and codes must be explained in the caption.

Source data

To ensure that the classification is reproducible, the individual plot records included in each unit should be reported in detail in the supplementary material, either by providing them directly as separate tables, or by listing the plot IDs in the databases from where the data have been retrieved, or by providing references to publications (including the original table and plot numbers in these sources).

Journal development

The year 2025 brought important news for the journal. In June, VCS received its first 2-year Journal Impact Factor from the Web of Science, and with 3.0 it was higher than we would have dreamed of. It reflects the average citation impact of the articles that we published in the years 2022 and 2023. The new CiteScore from the Scopus database was 3.6, which is a 44% increase from the previous year. The CiteScore published in summer 2025 reflects the impact of the articles published in the years 2021–2024. As of December 2025, the CiteScoreTracker has increased to 4.5 (reflecting the articles of the years 2020–2025).

Unfortunately, the positive bibliometric development was not reflected in increased submission rates; rather we had fewer manuscript submissions than in previous years. We successfully completed the collection on "Grasslands of Asia", a collaborative effort of the IAVS Regional Section Asia and the Eurasian Dry Grassland Group (EDGG) (Naqinezhad et al. 2025). The Special Collection "Classification of European forests and forest margins" is now almost completed with Khodosovtsev et al. (2025) as the latest published paper. About one dozen manuscripts have already been submitted to the Special Collection "Vegetation classification on islands and archipelagos", and more are expected, with Rinne et al. (2025) being the first published paper. Newly launched Special Collections include "Broad-scale classification of European vegetation" and "History of vegetation classification". However, while we are always open to propositions of additional Special Collections, we would particularly like to encourage submitting regular papers to VCS.

To consolidate VCS' role as the globally leading journal in the field of vegetation classification, we implemented several modifications in the author guidelines aimed at ensuring high quality and relevance to a global readership, becoming effective on 1 January 2026. Most importantly,

we now increased the minimum number of vegetation plots on which classification studies must be based to 100 in Europe and 50 outside Europe (this does not apply to methodological studies). Second, in agreement with many other journals, we are becoming stricter regarding documentation, meaning that for studies based on original plots (i.e., not retrieved from collaborative plot databases) we request that they are published as supplementary material, while coordinates can be given with less precision. We also strongly encourage publishing the R code (and the corresponding data files) underlying the analyses to increase the reproducibility of the research (and attract additional users and citations). Finally, we consider the opportunity to have photo plates of the main vegetation types described in the paper as an important addition for the sake of information as well as attractiveness. Still, we regularly encountered authors who opposed this recommendation; thus, we made photo plates obligatory for all classification studies in the strict sense from 2026 onwards.

Outstanding papers in 2025

As in every year, the Chief Editors selected one Editors' Choice article per quarter, and from these four articles the most outstanding one for the Editors' Award of the year.

The **Editors' Award 2025** went to the **Editors' Choice** paper of the **first quarter** by **Joelson et al. (2025)**. Natalia Zoe Joelson (Germany) and colleagues studied the forest communities in the Argentinian part of northern Patagonia. For this purpose, they collected 141 vegetation plots of 100 m^2 with stratified systematic sampling, aimed at good representation of both elevation and moisture gradients and covering the different parts of the study area. Based on this sound sampling, the authors conducted comprehensive statistical analyses, including unsupervised classification, ordination, indicator species analyses and ANOVAs to compare the properties of the derived communities. The authors could distinguish six community types, each well characterised by diagnostic species, and matched them with described phytosociological associations. Since South America is still poorly covered by plot-based vegetation studies in general and by formal syntaxonomic studies in particular, this paper is an important contribution to widening the state of knowledge on the vegetation in Patagonia and South America in general.

As **Editors' Choice** of the **second quarter**, we selected the VCS Methods paper **Monteiro-Henriques (2025)**. Tiago Monteiro-Henriques (Portugal) introduces a new method for vegetation classification, called TDV-optimization. TDV stands for Total Differential Value, the average of the DifferentialValues (DiffVal) of all species in a vegetation table. The author makes an interesting distinction between stochastic and differentiating absences of species. The DiffVal of each species ranges from 0 to 1 and indicates how well a certain species reflects the separation of relevé groups of any number in a vegetation table. The TDV can be used to search for the "optimal" partitioning, and the author developed an R package for this purpose. In the paper the author further tests the performance of his new method compared to previous automatic and manual methods of partitioning used in vegetation science with a real and an artificial dataset and generally found that TDV-optimization does well. Although not all authors will be convinced by the newly proposed Differential Value, the paper is impressive in its clarity of concepts and presentation, as well as its broad and informed review of previous numerical approaches to this core task of vegetation classification, such as *k*-means clustering, modified TWINSPAN, DIANA or ISOPAM. With these properties, Monteiro-Henriques (2025) has the potential to become highly cited as several other VCS Methods papers before. We look forward to seeing TDV-optimization being both applied and tested comprehensively, also in comparison to more recent approaches not included in the current comparison, such as GRIMP (Group Improvement; Tichý et al. 2019) and ICO-HES (Iterative Cluster Optimisation for Hierarchical Expert Systems; Vassilev et al. 2024). It would also be interesting to see whether and how TDV-optimization could be extended to hierarchical classification systems, which are a fundamental property of phytosociology. Without any doubt, VCS and its article category VCS Methods would be very eager to publish such follow-up studies.

The **Editors' Choice** of the **third quarter** was assigned to the Long Database Report by **Marshall et al. (2025)**. Zeke Marshall and colleagues (United Kingdom) present the new National Vegetation Plot Database for Great Britain (GBNVPD). It combines several pre-existing smaller databases with numerous other datasets that were previously not easily available. With 277,070 plot observations (including numerous resurveyed plots), it is now the second-largest national vegetation-plot database in Europe. This is an extremely valuable asset for biodiversity, global change and conservation studies at the national level and at the same time will massively improve the data coverage of NW Europe in continental and global studies based on the European Vegetation Archive (EVA; Chytrý et al. 2016) and the global database "sPlot" (Bruelheide et al. 2019). Moreover, with carefully curated fields of *in situ* measured environmental variables, this database sets a new standard for national vegetation plot databases. We thus can only congratulate Zeke Marshall and his team for this important achievement.

Finally, the **Editors' Choice** of the **fourth quarter** went to **Rinne et al. (2025)**. In their Research Paper, Lina Rinne and colleagues (Germany) present a detailed overview of the plant communities of arable fields and fallows on the Greek island of Lemnos. The contribution is part of the Special Collection 'Vegetation classification of islands and archipelagos'. Through herbicide application, strong fertilisation and intensification measures, arable weed communities throughout large parts of Europe have become species poor and homogenous, and many of the formerly widespread arable weeds are now threatened species. In some places of the Mediterranean, like the island of Lemnos, extensive management of arable fields

is still frequent. The authors sampled 174 plots in arable fields with different crops as well as in young fallows. They found a very rich vascular plant flora with a total of 357 taxa and up to 62 in a single 100 m^2 plot, including many obligatory agrestal species. There was a strong differentiation between spring and fall communities, the latter being significantly poorer in species and more homogeneous. By contrast, the spring communities were rich in species (mean: 26.6 per plot) and could be separated in four floristically well characterised communities. Due to their full coverage of Mediterranean Europe, mean Ecological Indicator Values for Europe (EIVE; Dengler et al. 2023) allowed the authors to visualise the different site conditions of the five distinguished community types. The study highlights that despite the extensive phytosociological knowledge in Europe and the synthesis of the higher vegetation types of the continent by Mucina et al. (2016) there are still open questions as the placement of the five agrestal communities from Lemnos in the European classification system was not unequivocal. The study stands out by a comprehensive documentation of a vegetation type that has become rare across the continent (arable fields with rich weed communities), state-of the art analysis, attractive and informative presentation of the results via synoptic tables and photo plates as well as full documentation of the data and the underlying R code in the supplementary materials.

Changes in the editorial team

We welcome Jian Zhang (Beijing, China) as a new Associate Editor, while Jozef Šibík, after six years in this role, will continue as a member of the Editorial Review Board. We newly appointed Svitlana Iemelianova, Esteban Muldavin, Pavel Novák, Gianmarco Tavilla and Massimo Terzi to the Editorial Review Board, while Miguel Alvarez, Christian Berg, Dariia Borovyk, Miquel De Cáceres, Vanessa Leite Rezende and Zhiyao Tang left it. We regret that after years of very careful service, Don Faber-Langendoen decided to step down from his role as Linguistic Editor, while remaining as Editorial Review Board member. We would like to express our gratitude to those who served in the Editorial Team in the last years, and we wish all new members a good spirit and success in their roles.

Conclusions and outlook

During its first six years of existence, VCS overcame the initial struggle for survival and firmly established itself as the globally leading journal in the field of vegetation classification. After decades during which classification studies were rarely published in international journals, we realise that common standards in methodology and presentation appear to have eroded somewhat or had, at least not regularly been updated and reshaped by international expert discussion. In this editorial, we focus on synoptic tables as one core element of presenting vegetation typologies. We hope that our explanations will help authors to prepare more informative versions of such tables, be it inside or outside VCS. Our ideas proposed here are also not carved in stone and thus, like previous ideas/standards, remain open to informed discussion and may be superseded when even better solutions become available.

Author contributions

The editorial was jointly drafted by WW and JD while all three authors carefully revised it.

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Appendix 1. Reviewers for VCS during 2025

We thank our reviewers during the last year who greatly contributed to the success of VCS. The number of reviews conducted is indicated in brackets.

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